



**American Certification Body, Inc.**

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**RF exposure analysis for the equipment N5321 (FCC ID: VV7-MBMN5321; IC:287AG-MBMN5321)**

The device N5321 (FCC ID: VV7-MBMN5321; IC: 287AG-MBMN5321) is designed as module to be installed in other devices. This device is to be used only for fixed and mobile applications. If the final product after integration is intended for portable use, new applications and FCC and IC are required.

The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all the persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

**MPE exposure limits**

The table below is excerpted from Table 1B of 47 CFR 1.1310 titled Limits for Maximum Permissible Exposure (MPE), Limits for General Population/Uncontrolled Exposure:

Frequency Range (MHz)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
300 – 1500	f (MHz) /1500	30
1500 – 100.000	1,0	30

The table below is excerpted from RSS-102, Issue 4, 4.2, titled “RF Limits for Devices used by the General Public”:

Frequency Range (MHz)	Power density (W/m <sup>2</sup> )	Averaging time (minutes)
300 – 1500	f (MHz) /150	6
1500 – 100.000	10	6

**EIRP/ERP limits**

For 850 MHz frequency band and according to FCC §22.913 the maximum ERP of the device is 7 W (equivalent to 11,48 W EIRP) while IC SRSP-503 defines an EIRP limit of 11,5 W.

For 1900 MHz frequency band and according to FCC §24.232 and IC SRSP-510, the maximum EIRP of the device should be lower than 2 W.

Using the equation  $S = \frac{PG}{4\pi R^2}$  to calculate the exposure to electromagnetic fields

- where: S = power density (in appropriate units, e.g. mW/cm<sup>2</sup>)
- P = power input to the antenna (in appropriate units, e.g., mW)
- G = power gain of the antenna in the direction of interest relative to an isotropic radiator
- R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

The maximum allowed gains of the antennas to be used with this device in order to guarantee compliance with MPE and ERP/EIRP can be calculated as shown in the following pages.



## 850 MHz frequency band

2G operation																
Band	Modulation	Test Mode	Channel		Frequency (MHz)	Avg burst Conducted power (dBm)	Peak Conducted power (dBm)	Duty cycle (%)	FCC/IC MPE limit (mW/cm <sup>2</sup> )	FCC ERP limit per §22.913 (W)	IC ERP limit per SRSP-503 (W)	Evaluation distance for compliance with MPE limits (cm)	Antenna gain to meet FCC/IC MPE limit (dBi)	Antenna gain to meet FCC ERP limit (dBi)	Antenna gain to meet IC ERP limit (dBi)	Maximum antenna gain to meet all the limits (dBi)
			Lowest	Highest												
GPRS 850 Multi Class:10 Max Down:4 Sum:5	GMSK	4Down1Up factor 1/8 Duty	Lowest	128	824.2	31,19	31,32	25%	0,55	11,48	11,50	20	9,24	9,40	9,41	9,24
			Middle	190	836,6	31,37	31,56	25%	0,56	11,48	11,50	20	9,12	9,22	9,23	9,12
			Highest	251	848,8	31,53	31,66	25%	0,57	11,48	11,50	20	9,03	9,06	9,07	9,03
		3Down2Up factor 2/8 Duty	Lowest	128	824.2	31,10	31,21	50%	0,55	11,48	11,50	20	6,32	9,49	9,50	6,32
			Middle	190	836,6	31,23	31,42	50%	0,56	11,48	11,50	20	6,25	9,36	9,37	6,25
			Highest	251	848,8	31,37	31,55	50%	0,57	11,48	11,50	20	6,18	9,22	9,23	6,18
EGPRS 850 Multi Class:10 Max Down:4 Sum:5	8PSK	4Down1Up factor 1/8 Duty	Lowest	128	824.2	26,46	29,55	25%	0,55	11,48	11,50	20	13,97	14,13	14,14	13,97
			Middle	190	836,6	26,55	29,71	25%	0,56	11,48	11,50	20	13,94	14,04	14,05	13,94
			Highest	251	848,8	26,64	29,83	25%	0,57	11,48	11,50	20	13,92	13,95	13,96	13,92
		3Down2Up factor 2/8 Duty	Lowest	128	824.2	26,36	29,47	50%	0,55	11,48	11,50	20	11,06	14,23	14,24	11,06
			Middle	190	836,6	26,48	29,63	50%	0,56	11,48	11,50	20	11,00	14,11	14,12	11,00
			Highest	251	848,8	26,51	29,74	50%	0,57	11,48	11,50	20	11,04	14,08	14,09	11,04
3G operation																
Band	Modulation	Date Rate or Sub-test	CH		Frequency (MHz)	Avg burst Conducted power (dBm)	Peak Conducted power (dBm)	Duty cycle (%)	FCC/IC MPE limit (mW/cm <sup>2</sup> )	FCC ERP limit per §22.913 (W)	IC ERP limit per SRSP-503 (W)	Evaluation distance for compliance with MPE limits (cm)	Antenna gain to meet FCC/IC MPE limit (dBi)	Antenna gain to meet FCC ERP limit (dBi)	Antenna gain to meet IC ERP limit (dBi)	Maximum antenna gain to meet all the limits (dBi)
			Lowest	Highest												
WCDMA V	RMC12.2K	---	Lowest	4132	826,4	22,34	25,54	100%	0,55	11,48	11,50	20	12,08	18,25	18,26	12,08
			Middle	4183	836,6	22,40	25,72	100%	0,56	11,48	11,50	20	12,07	18,19	18,20	12,07
			Highest	4233	846,6	22,23	25,46	100%	0,56	11,48	11,50	20	12,29	18,36	18,37	12,29
HSDPA V	QPSK	1	Lowest	4132	826,4	22,18	25,19	100%	0,55	11,48	11,50	20	12,24	18,41	18,42	12,24
			Middle	4183	836,6	22,21	25,23	100%	0,56	11,48	11,50	20	12,26	18,38	18,39	12,26
			Highest	4233	846,6	21,99	25,06	100%	0,56	11,48	11,50	20	12,53	18,60	18,61	12,53
		2	Lowest	4132	826,4	22,16	25,17	100%	0,55	11,48	11,50	20	12,26	18,43	18,44	12,26
			Middle	4183	836,6	22,20	25,22	100%	0,56	11,48	11,50	20	12,27	18,39	18,40	12,27
			Highest	4233	846,6	21,97	25,04	100%	0,56	11,48	11,50	20	12,55	18,62	18,63	12,55
		3	Lowest	4132	826,4	21,67	24,68	100%	0,55	11,48	11,50	20	12,75	18,92	18,93	12,75
			Middle	4183	836,6	21,69	24,71	100%	0,56	11,48	11,50	20	12,78	18,90	18,91	12,78
			Highest	4233	846,6	21,50	24,57	100%	0,56	11,48	11,50	20	13,02	19,09	19,10	13,02
		4	Lowest	4132	826,4	21,66	24,67	100%	0,55	11,48	11,50	20	12,76	18,93	18,94	12,76
			Middle	4183	836,6	21,70	24,72	100%	0,56	11,48	11,50	20	12,77	18,89	18,90	12,77
			Highest	4233	846,6	21,46	24,53	100%	0,56	11,48	11,50	20	13,06	19,13	19,14	13,06
HSUPA V	QPSK	1	Lowest	4132	826,4	21,48	23,56	100%	0,55	11,48	11,50	20	12,94	19,11	19,12	12,94
			Middle	4183	836,6	21,69	23,71	100%	0,56	11,48	11,50	20	12,78	18,90	18,91	12,78
			Highest	4233	846,6	21,36	23,49	100%	0,56	11,48	11,50	20	13,16	19,23	19,24	13,16
		2	Lowest	4132	826,4	19,49	21,57	100%	0,55	11,48	11,50	20	14,93	21,10	21,11	14,93
			Middle	4183	836,6	19,68	21,70	100%	0,56	11,48	11,50	20	14,79	20,91	20,92	14,79
			Highest	4233	846,6	19,33	21,46	100%	0,56	11,48	11,50	20	15,19	21,26	21,27	15,19
		3	Lowest	4132	826,4	20,49	22,57	100%	0,55	11,48	11,50	20	13,93	20,10	20,11	13,93
			Middle	4183	836,6	20,68	22,70	100%	0,56	11,48	11,50	20	13,79	19,91	19,92	13,79
			Highest	4233	846,6	20,38	22,51	100%	0,56	11,48	11,50	20	14,14	20,21	20,22	14,14
		4	Lowest	4132	826,4	19,47	21,55	100%	0,55	11,48	11,50	20	14,95	21,12	21,13	14,95
			Middle	4183	836,6	19,67	21,69	100%	0,56	11,48	11,50	20	14,80	20,92	20,93	14,80
			Highest	4233	846,6	19,32	21,45	100%	0,56	11,48	11,50	20	15,20	21,27	21,28	15,20
		5	Lowest	4132	826,4	21,46	23,54	100%	0,55	11,48	11,50	20	12,96	19,13	19,14	12,96
			Middle	4183	836,6	21,68	23,70	100%	0,56	11,48	11,50	20	12,79	18,91	18,92	12,79
			Highest	4233	846,6	21,33	23,46	100%	0,56	11,48	11,50	20	13,19	19,26	19,27	13,19

Maximum antenna gain for **850 MHz** frequency band: **6,18 dBi**



## 1900 MHz frequency band

2G operation																
Band	Modulation	Test Mode	Channel		Frequency (MHz)	Avg burst Conducted power (dBm)	Peak Conducted power (dBm)	Duty cycle (%)	FCC/IC MPE limit (mW/cm <sup>2</sup> )	FCC ERP limit per §24.232 (W)	IC ERP limit per SRSP-510 (W)	Evaluation distance for compliance with MPE limits (cm)	Antenna gain to meet FCC/IC MPE limit (dBi)	Antenna gain to meet FCC ERP limit (dBi)	Antenna gain to meet IC ERP limit (dBi)	Maximum antenna gain to meet all the limits (dBi)
			Lowest	Highest												
GPRS 1900 Multi Class :10 Max Down:4 Sum:5	GMSK	4Down1Up factor 1/8 Duty	Lowest	512	1850.2	28.53	28.69	25%	1.00	2.00	2.00	20	14.50	4.48	4.48	4.48
			Highest	661	1909.8	28.71	28.88	25%	1.00	2.00	2.00	20	14.32	4.30	4.30	4.30
			Highest	810	1909.8	28.87	29.03	25%	1.00	2.00	2.00	20	14.16	4.14	4.14	4.14
		3Down2Up factor 2/8 Duty	Lowest	512	1850.2	28.44	28.56	50%	1.00	2.00	2.00	20	11.58	4.57	4.57	4.57
			Highest	661	1909.8	28.66	28.74	50%	1.00	2.00	2.00	20	11.36	4.35	4.35	4.35
			Highest	810	1909.8	28.75	28.89	50%	1.00	2.00	2.00	20	11.27	4.26	4.26	4.26
EGPRS 1900 Multi Class :10 Max Down:4 Sum:5	8PSK	4Down1Up factor 1/8 Duty	Lowest	512	1850.2	25.63	28.81	25%	1.00	2.00	2.00	20	17.40	7.38	7.38	7.38
			Middle	661	1880.0	25.72	28.93	25%	1.00	2.00	2.00	20	17.31	7.29	7.29	7.29
			Highest	810	1909.8	25.91	29.01	25%	1.00	2.00	2.00	20	17.12	7.10	7.10	7.10
		3Down2Up factor 2/8 Duty	Lowest	512	1850.2	25.52	28.73	50%	1.00	2.00	2.00	20	14.50	7.49	7.49	7.49
			Highest	661	1909.8	25.71	28.88	50%	1.00	2.00	2.00	20	14.31	7.30	7.30	7.30
			Highest	810	1909.8	25.86	28.96	50%	1.00	2.00	2.00	20	14.16	7.15	7.15	7.15
3G operation																
Band	Modulation	Date Rate or Sub-test	CH		Frequency (MHz)	Avg burst Conducted power (dBm)	Peak Conducted power (dBm)	Duty cycle (%)	FCC/IC MPE limit (mW/cm <sup>2</sup> )	FCC ERP limit per §24.232 (W)	IC ERP limit per SRSP-510 (W)	Evaluation distance for compliance with MPE limits (cm)	Antenna gain to meet FCC/IC MPE limit (dBi)	Antenna gain to meet FCC ERP limit (dBi)	Antenna gain to meet IC ERP limit (dBi)	Maximum antenna gain to meet all the limits (dBi)
			Lowest	Highest												
WCDMA II	RMC12.2K	---	Lowest	9262	1852.4	22.32	25.12	100%	1.00	2.00	2.00	20	14.69	10.69	10.69	10.69
			Middle	9400	1880.0	22.43	25.24	100%	1.00	2.00	2.00	20	14.58	10.58	10.58	10.58
			Highest	9538	1907.6	22.24	25.08	100%	1.00	2.00	2.00	20	14.77	10.77	10.77	10.77
HSDPA II	QPSK	1	Lowest	9262	1852.4	22.18	24.99	100%	1.00	2.00	2.00	20	14.83	10.83	10.83	10.83
			Middle	9400	1880.0	22.32	25.05	100%	1.00	2.00	2.00	20	14.69	10.69	10.69	10.69
			Highest	9538	1907.6	22.11	24.96	100%	1.00	2.00	2.00	20	14.90	10.90	10.90	10.90
		2	Lowest	9262	1852.4	22.16	24.97	100%	1.00	2.00	2.00	20	14.85	10.85	10.85	10.85
			Middle	9400	1880.0	22.31	25.04	100%	1.00	2.00	2.00	20	14.70	10.70	10.70	10.70
			Highest	9538	1907.6	22.08	24.93	100%	1.00	2.00	2.00	20	14.93	10.93	10.93	10.93
		3	Lowest	9262	1852.4	21.69	24.50	100%	1.00	2.00	2.00	20	15.32	11.32	11.32	11.32
			Middle	9400	1880.0	21.80	24.53	100%	1.00	2.00	2.00	20	15.21	11.21	11.21	11.21
			Highest	9538	1907.6	21.60	24.45	100%	1.00	2.00	2.00	20	15.41	11.41	11.41	11.41
		4	Lowest	9262	1852.4	21.67	24.48	100%	1.00	2.00	2.00	20	15.34	11.34	11.34	11.34
			Middle	9400	1880.0	21.79	24.52	100%	1.00	2.00	2.00	20	15.22	11.22	11.22	11.22
			Highest	9538	1907.6	21.59	24.44	100%	1.00	2.00	2.00	20	15.42	11.42	11.42	11.42
HSUPA II	QPSK	1	Lowest	9262	1852.4	21.32	24.15	100%	1.00	2.00	2.00	20	15.69	11.69	11.69	11.69
			Middle	9400	1880.0	21.46	24.27	100%	1.00	2.00	2.00	20	15.55	11.55	11.55	11.55
			Highest	9538	1907.6	21.28	24.11	100%	1.00	2.00	2.00	20	15.73	11.73	11.73	11.73
		2	Lowest	9262	1852.4	19.34	22.17	100%	1.00	2.00	2.00	20	17.67	13.67	13.67	13.67
			Middle	9400	1880.0	19.45	22.26	100%	1.00	2.00	2.00	20	17.56	13.56	13.56	13.56
			Highest	9538	1907.6	19.29	22.12	100%	1.00	2.00	2.00	20	17.72	13.72	13.72	13.72
		3	Lowest	9262	1852.4	20.34	23.17	100%	1.00	2.00	2.00	20	16.67	12.67	12.67	12.67
			Middle	9400	1880.0	20.44	23.25	100%	1.00	2.00	2.00	20	16.57	12.57	12.57	12.57
			Highest	9538	1907.6	20.27	23.10	100%	1.00	2.00	2.00	20	16.74	12.74	12.74	12.74
		4	Lowest	9262	1852.4	19.31	22.14	100%	1.00	2.00	2.00	20	17.70	13.70	13.70	13.70
			Middle	9400	1880.0	19.44	22.25	100%	1.00	2.00	2.00	20	17.57	13.57	13.57	13.57
			Highest	9538	1907.6	19.27	22.10	100%	1.00	2.00	2.00	20	17.74	13.74	13.74	13.74
5	Lowest	9262	1852.4	21.30	24.13	100%	1.00	2.00	2.00	20	15.71	11.71	11.71	11.71		
	Middle	9400	1880.0	21.45	24.26	100%	1.00	2.00	2.00	20	15.56	11.56	11.56	11.56		
	Highest	9538	1907.6	21.25	24.08	100%	1.00	2.00	2.00	20	15.76	11.76	11.76	11.76		

Maximum antenna gain for 1900 MHz frequency band: 4,14 dBi